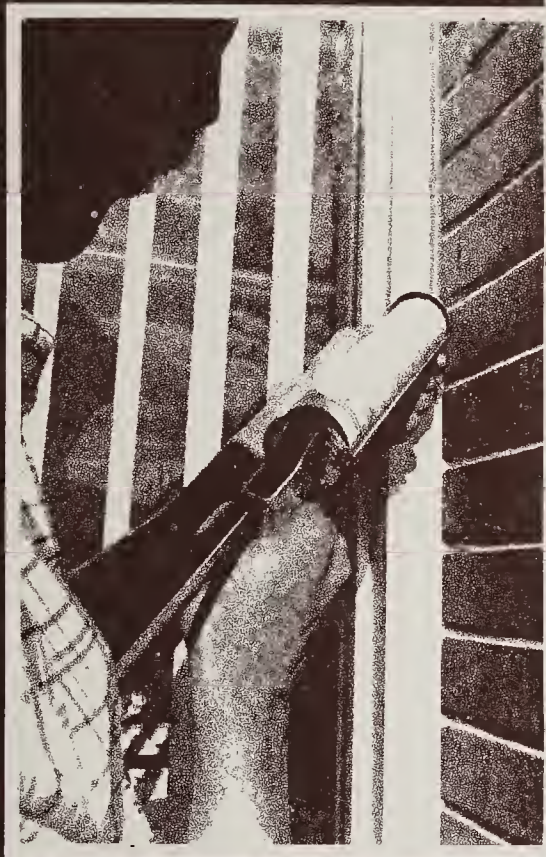


S  
696  
m262  
1978?

# HOW TO CUT ENERGY EXPENSES IN YOUR BUSINESS



**Ways To Save Energy and Money On...**

**LIGHTING • SPACE HEATING • AIR CONDITIONING  
REFRIGERATION • AND MORE**

**PLUS**

**WHERE TO GET HELP ON YOUR  
ENERGY CONSERVATION PLAN**





# MAKING ENERGY CONSERVATION YOUR BUSINESS

---

As a businessman you count the cost of the energy you use as part of your expenses. You can't afford to waste it because, as energy becomes more scarce, the price goes up. And, rising energy costs can increase operating expenses and eat into profits.

Fortunately, energy cost reduction is feasible for all businesses. This booklet contains numerous energy conservation measures—many of them do-it-yourself. For example, you can install a timing device that automatically sets back your thermostat after business hours. Reducing number of lights where they are not really needed is another easy way to savings. These and other suggestions in this booklet are your tools for your own energy cost reduction plan.







## PUT SOMEONE IN CHARGE

Assure your conservation effort a chance for success by designating a person to see that it is implemented and to mark the progress of the plan.

## ASSESS YOUR ENERGY NEEDS

Begin by assessing your energy needs and waste using the energy “audit” in the back of this booklet. Set your conservation goal, then apply suggestions found in this booklet where they seem feasible.

## YOUR LOCAL UTILITY CAN HELP

Representatives of your local utility can be invited to visit your business and make knowledgeable suggestions on a conservation program tailored to your operation. They can also help you follow through on an energy plan of your own design.

## TRADE GROUPS

Depending on your type of business, there may be a trade association representing your

business, and it may have a Conservation Program. Some trade associations are more advanced with conservation efforts than others, and publish handbooks or articles on energy conservation pertinent to the specific trade.

## SEND FOR PUBLICATIONS

Listed in the back of this booklet are numerous publications on energy cost-cutting geared to specific types of business operations. These may be ordered to provide more comprehensive information about energy cost reduction in your firm.

## BROUGHT TO YOU BY...

The Montana Chamber of Commerce, the Montana Power Company, Montana-Dakota Utilities Co., Great Falls Gas Company, Pacific Power & Light Company and the Montana Energy Office, **in cooperation with your local Chamber of Commerce**, are pleased to provide this “How to Cut Energy Expenses” Booklet to Montana business.

## CONTENTS

---

Interior Lighting	pg. 4 & 5
Outdoor Lighting	pg. 6
Space Heating	pg. 7 & 8
Weatherization	pg. 9
Air Conditioning	pg. 10
Refrigeration	pg. 11
Warehousing	pg. 12
Other Energy Conservation Ideas	pg. 13
Other Energy Publications	pg. 14
Tracking Energy Use	pg. 15
Energy Audit	pg. 16



# INTERIOR LIGHTING

---

Because lighting plays such an important role in merchandising in most retail stores, it represents an area of important savings potential. Many retail establishments are overlit by modern efficiency standards, and others are inefficiently lit, in particular when display lighting is considered. Lighting is probably the greatest energy expense.

## 1. RELAMP WITH LOW ENERGY TYPES

Replacement of lamps with low energy types will reduce lighting costs without affecting lighting quality.

There are new low-energy lamps on the market for fluorescent, incandescent and flood types. They are mechanically and electrically interchangeable with the standard variety. The new tubes, which produce slightly less light, consume 10-20% less electricity, the cost of which more than justifies replacement. These lamps are made by all the major manufacturers of bulbs.

## 2. REMOVE ALL UNNECESSARY LAMPS

Where light levels are excessive, remove unnecessary lamps from existing fixtures. It is feasible to reduce light levels by 25% in many cases.

Light level is not exactly linear with the number of fixtures, but for practical purposes we can consider it that way. For example, if existing light level is 100 foot-candles and 50 foot-candles is the desired level, then one out of two lamps should be removed.

Obvious places for lamp removal are those where natural light is adequate or in non-working areas. Selectively remove incandescent and fluorescent lamps that are superfluous. In most cases, fluorescent lamps must be removed in pairs and ballasts should be disconnected so that current is not being drawn.



## 3. USE LOWER WATTAGE LAMPS

Wherever possible, bulbs should be of a lower wattage if the user can tolerate the reduced light level.

In the process of determining areas of lighting inefficiency, take special note of the level of wattage in bulbs currently used. Before relamping with low-energy bulbs, make a conscious effort to also scale down the level of wattage.

## 4. CONTROL LIGHT USAGE

All fixtures should be shut off when not in use. It is no longer true that fluorescents should *not* be switched off during the work day. Recent studies show that if such lighting is not required for as little as 10 minutes, it pays to shut it off.

Make it convenient for people to shut off lights by:

- Installing that switch as near the entrance to the space as possible.
- Putting the switch outside, if possible, and using a switch with a pilot light to indicate that the lights are on.
- Using timers to turn switches off after a preset period of time. These devices can be purchased with dial settings of 30 seconds to 24 hours. They are a direct replacement for the existing toggle switch and will take an electrician about ten minutes to install. The timers cost about \$6 to \$8 excluding installation.
- Wiring them all to one switch or in rooms where a large number of lamps operate on a single switch or circuit, have an electrician rewire an existing electric line into two or more circuits and install separate switches. This will enable you to turn off lights in unused or naturally lighted areas.

## 5. USE MORE EFFICIENT SOURCES

There is a variety of lighting sources acceptable for indoor use with varied rates of efficiency. Select the most productive light source that is appropriate for the task. Savings from this recommendation, if applicable, can run as high as 50%.



# INTERIOR LIGHTING

Lighting efficiency is defined as the amount of light produced (lumens) per unit of electricity consumed (watt) and is measured in lumens per watt (LPW). Fluorescent is four times as efficient as incandescent. Metal halide lamps are even more efficient than fluorescent, but can only be used when ceiling height is greater than 10 feet.

For most retail applications, fluorescents should be used with some incandescents to highlight the product.

When hours of use are more than 3,000 annually, it will be cost effective to convert from incandescent to fluorescent.

Use metal halides where feasible, particularly in storage areas with high bays.

Install one 150 watt high pressure sodium lamp with the appropriate fixture, and turn off fluorescents at night.

An alternative source from minimum light would be a 35 watt low-pressure sodium lamp, which plugs into a 110-125V circuit and is easily mounted on a wall or ceiling.

The chart below indicates the range of lumens per watt produced by various light sources.

TYPE LAMP	RANGE OF WATTAGES	INITIAL LUMENS PER WATT
INCANDESCENT	100-1500	17-24
MERCURY VAPOR	50-1000	32-63
FLUORESCENT	40-215	74-84
METAL HALIDE	175-1000	80-115
HIGH PRESSURE SODIUM	70-1000	83-140

“Long-Life” incandescent bulbs, designed to burn for 2, 3, or 5 years, are expensive and inefficient in comparison with any other lamp of the same wattage. They are, therefore, recommended only where lighting maintenance is irregular or difficult and incandescent lighting is desirable.

In rooms having high ceilings, replace ceiling-height lighting fixtures with hanging lamps to bring light closer to the areas needing illumination, being careful to avoid glare.

## 6. USE EFFICIENT SECURITY LIGHTING

Very often, stores employ the fluorescent lights used during daytime operation for security lights in the evening. High pressure sodium lamps should be used for security purposes because they produce twice as much light per watt of electricity as fluorescent lamps, thereby, reducing electrical consumption dramatically.

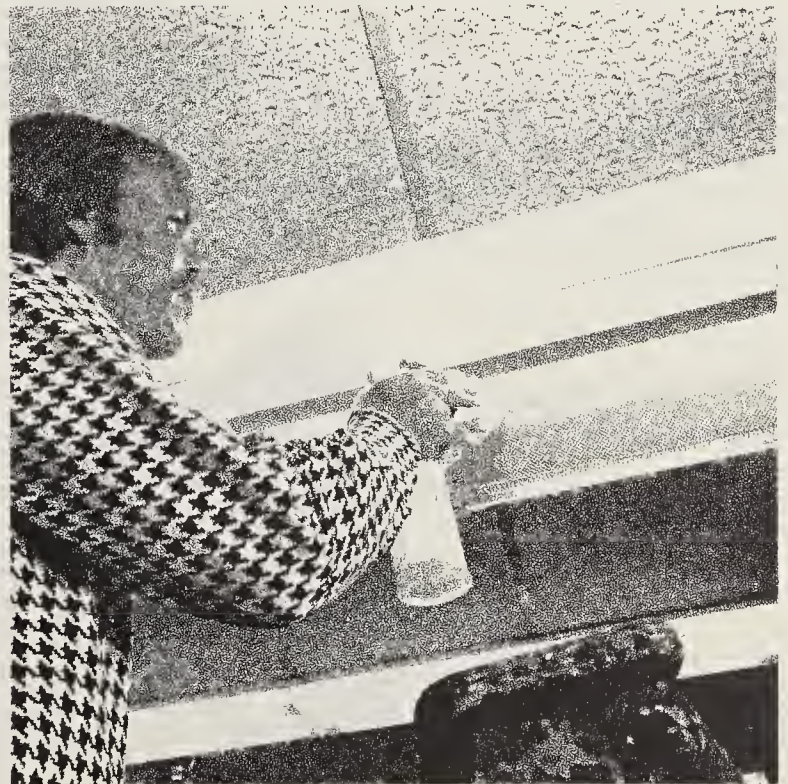
The light level can be as low as 2.5 foot-candles. An alternative source for minimum light would be a 35 watt low pressure sodium lamp, which plugs into an ordinary 110-125V circuit and is easily mounted on a wall or ceiling.

## 7. MAINTAIN LIGHTING SYSTEM

In the past, lighting systems were designed for an allowance of lamp deterioration and accumulation of dirt, a 15% depreciation in output was neither noticed nor important. Today, however, with closely designed energy-efficient systems, that same reduction is not tolerable when dirt accumulates. Clean fixtures and lamps annually.

If any renovating or painting is planned, paint all walls and ceilings a light color to reflect light as a way to reduce required lighting and electric power use.

An added plus for reducing the lighting load—it will help cut the monthly air conditioning costs.





# OUTDOOR LIGHTING

Outdoor lighting is a significant energy cost in business operations for two distinct purposes—merchandising, security/parking and for each of these uses, different requirements may apply. Outdoor lighting for signs and display purposes is necessary from dusk to the close of operation, approximately 1500 hours per year. It is considered desirable to have good color rendition, and relatively high light levels—5-25 foot-candles. For purposes of parking lot lighting or security, color is not critical. A light level of 2-4 foot-candles is acceptable. Security lighting from dusk to dawn operation is usually 4,380 hours per year.

## IMPROVE MERCHANDISING & DISPLAY SIGN LIGHTING

Much of the outdoor lighting used today for attracting customers' attention is of excessive levels and in operation too long. Metal halides efficiently provide adequate light of good color. Cost savings can be 50%, depending on present use.

The most efficient source of outdoor merchandising lighting is the metal halide lamp. It is usually cost-effective to relamp areas which have either fluorescent or incandescent lighting with metal halide types, even though new fixtures may be required. Mercury vapor lamps should *not* be relamped with metal halides unless more light is required or in cases where the fixtures are interchangeable.

## IMPROVE PARKING LOT & SECURITY LIGHTING

In outdoor storage or security lighting, the most efficient light source is the high pressure sodium. It gives off a yellow color unsatisfactory for merchandising purpose, but adequate for security light.

Where existing light is metal halide, it pays to convert to high pressure sodium. New fixtures may be necessary, but they will pay for themselves through savings in electric costs.

Remove lamps where light is not needed.

Reduce wattage levels in fixtures.

Turn off all signs after closing or when significant traffic periods are over. All night operation of signs is of questionable value.

Control hours of use so that operating times coincide with twilight hours until closing time. Consider using photocell controls or changing time clocks monthly as seasons change.

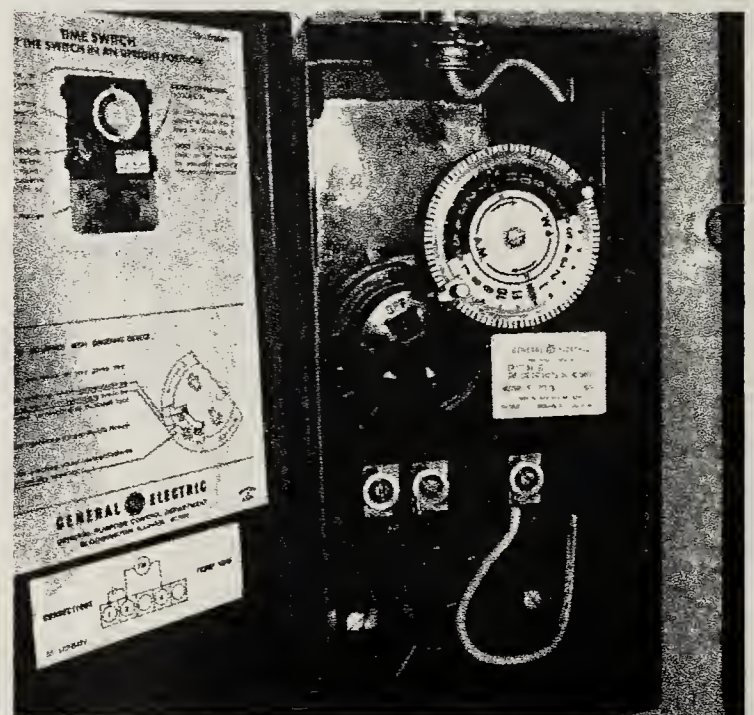
Install manual switches for the remaining parking lot fixtures to insure operation only during peak nighttime traffic hours.

Remember that your customers are aware of energy costs and may disapprove of any excessive use of electricity. Flashy signs may hurt your business.

Get professional help if needed.

If parking lot lighting is an important component of the store's competitive attraction, consider using 3 to 5 foot-candles in front of the store and 1 to 2 foot-candles in the remainder of the lot.

Install a photoelectric device or a time clock, for the main cluster of fixtures near the store entrance. This will insure that these lights are on (sufficiently to provide adequate visibility to unlock car doors and load groceries) only when it is dark enough to require parking lights and when the store is open.





The potential for cost reduction on heating expenses is very real for the business owner. Historically, the control of the environment temperature has been significant in retail operations because of emphasis on customer and employee comfort, and the fact that energy used to be cheaper. When it was inexpensive to keep temperature levels comfortable, we became accustomed to heating temperatures that were unnecessarily high. There are a number of ways to reduce heating costs that are practical for almost all stores and businesses. By modifying current space heating practices, meaningful savings can result without sacrificing sales, customer or employee comfort and without damage to merchandise.

## SETBACK TEMPERATURES TO 55°

Business places are usually overheated during unoccupied night and weekend hours.

In office, showroom and shop areas, there should be no problem whatever with this temperature. The savings achievable upon implementation of this recommendation are significant as seen in the table included.

Many business people have questioned the advisability of setback because of energy used for warm-up the next day. Investigations show that setback as recommended for 8 hours or more is always cost effective.

Methods of achieving setback are as varied as the number of heating and control systems themselves. Many offices and showrooms are heated by rooftop gas fired units. Older stores sometimes use steam boilers. One type of setback control will work for either of the above systems.

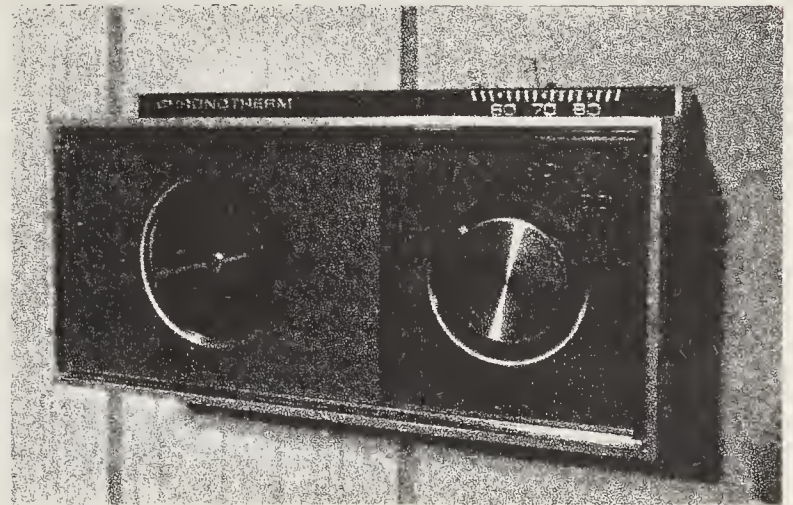
A setback thermostat set to 55°F is required; a time clock will switch system control from local thermostats to the setback stat at the desired time and will then return the system to the control of the local stats at a predetermined hour in the morning.

This time will have to be determined on an individual basis and may need to be changed once or twice a year due to large variations in outdoor air temperatures.

Generally, only one setback thermostat will be required even though there is more than one zone.

In the case of package-type rooftop units, it is very likely that the manufacturer of the equipment can supply a retrofit kit for setback control.

With electric heating, setback is accomplished by interrupting the power to the heating unit itself (not the thermostat as in other cases) with arrangement of time clocks, thermostats, relays or contactors.



**AVERAGE ANNUAL PERCENT SAVINGS POSSIBLE FROM NIGHT SETBACK FOR A TYPICAL RETAIL OPERATION\***

30 Yr. Avg. HEATING						
	Degree Days	65°	62°	60°	57°	55°
Billings	7,265	4.1%	8.4%	11.2%	15.3%	18.1%
Bozeman	8,165	3.7	7.4	9.7	13.5	15.9
Butte	9,719	2.8	5.7	7.6	10.5	12.3
Cut Bank	9,033	3.2	6.4	8.4	11.8	13.1
Glendive	7,774	3.9	7.9	10.3	14.5	16.9
Great Falls	7,652	3.9	8.0	10.6	14.6	17.1
Helena	8,190	3.7	7.3	9.7	13.5	15.9
Missoula	7,931	3.8	7.7	10.2	14.1	16.6
Miles City	7,889	3.8	7.7	10.2	14.1	16.6
Kalispell	8,554	3.5	6.9	9.2	12.7	15.0

\*Assuming An Initial Thermostat Setting Of 68°  
And Ten Hours Of Setback Six Nights Per Week  
Plus 24 Hours Of Setback On Sunday

# HEATING

## REDUCE OPERATING TEMPERATURES

Significant energy costs can be saved by reducing heating temperatures to lower, more economical levels between 65°F and 68°F.

Depending on the type of operation, it is practical to reduce temperatures to levels in the mid 60's. Acceptable levels will depend on the type of shopping and whether or not coats are worn by customers in the store. Savings achievable by temperature reduction are large, because they are on a 24 hour basis. A table provided shows the savings achievable by reducing temperatures to lower levels. The table is based on a 75°F reference.

Reset thermostat to either 65°F or 68°F, as appropriate. When thermostats are set at lower levels than those to which people are accustomed, there is a risk of constant tampering and adjusting. A variety of thermostat guards and covers, available from a heating and controls contractor, can be easily installed and locked with a key.



## REDUCE HEAT LOSS THROUGHOUT STORE

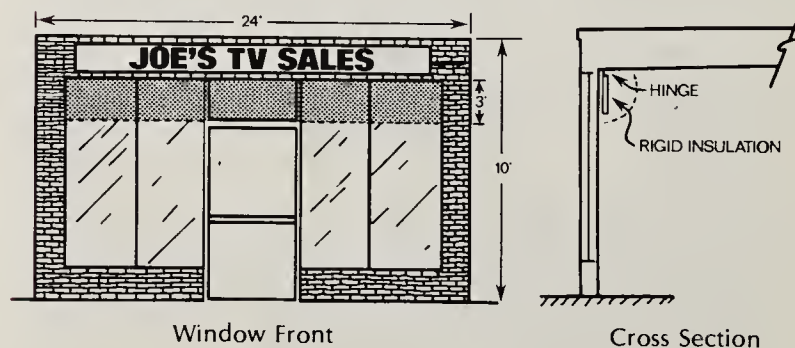
Often large storefront windows, particularly in shopping centers in open areas exposed to wind conditions, leak large amounts of conditioned air—both heated and cooled. This loss can be corrected without altering the usefulness of the window through the addition of insulation or thermal curtains.

By providing rigid Styrofoam insulation or thermal curtains in the upper 3 feet of a window, heat loss will be reduced.

The diagram below shows the area and display window where insulation should be applied.

AVERAGE ANNUAL PERCENT SAVINGS POSSIBLE FROM OPERATING TEMPERATURE REDUCTIONS FOR A TYPICAL RETAIL OPERATION*					
30 Yr. Avg. HEATING					
	Degree Days	72°	68°	65°	60°
Billings	7,265	8.4%	19.4%	27.8%	41.7%
Bozeman	8,165	7.3	17.1	24.5	36.8
Butte	9,719	5.6	13.3	18.9	28.7
Cut Bank	9,033	6.4	15.0	21.4	32.4
Glendive	7,774	7.8	18.0	26.0	39.0
Great Falls	7,652	7.9	18.4	26.3	39.5
Helena	8,190	7.3	17.1	25.5	36.8
Missoula	7,931	7.7	17.9	25.6	37.9
Miles City	7,889	7.7	17.9	25.6	38.4
Kalispell	8,554	6.9	15.1	23.0	34.7

\*Setback From 75°





## ADD ROOF AND OTHER INSULATION

The greatest heat transfer occurs through the roof of the building—between 50 and 65 per cent.

Depending on the type of building, additional roof insulation is another which should be high on your list of priorities. Heated buildings should have a minimum of 10 to 12 inches of insulation to reduce heat loss and save fuel.



Where roof insulation is not practical, consider insulating the top floor ceiling. This can be done easily with blown insulation. In most cases, ceiling insulation also will require a vapor barrier placed on the warm side of the ceiling—if not integral with the insulation—to prevent structural damage caused by rot, corrosion or expansion of freezing water.

If remodeling or modernization is contemplated, consider adding insulation to all exterior walls as well as those which separate conditioned and nonconditioned spaces.

Add or improve insulation under floors over garages or other conditioned areas.

It is advised strongly that expert technical assistance be obtained before undertaking any insulating to help ensure that the proper type and correct amount are installed, that cost effectiveness will result, and that any potential problems—such as moisture condensation—can be avoided.

### TYPE OF INSULATION

BATTS OR BLANKETS			LOOSE FILL (POURED IN)		
					
	glass fiber	rock wool	glass fiber	rock wool	cellulosic fiber
R-11	3½"-4"	3"	5"	4"	3"
R-19	6"-6½"	5¼"	8"-9"	6"-7"	5"
R-22	6½"	6"	10"	7"-8"	6"
R-30	9½"-10½"*	9"*	13"-14"	10"-11"	8"
R-38	12"-13"*	10½"*	17"-18"	13"-14"	10"-11"

\*two batts or blankets required

## REDUCE INFILTRATION LOSSES

Infiltration is air entering a space through cracks and holes around doors and windows. This colder, outside air must then be conditioned, requiring additional energy consumption. This additional energy costs approximately \$60 in smaller rooms and \$150 or more in larger storage rooms. Generally, for every ten linear feet of a 1/16 inch crack that is sealed, approximately one MCF or \$2.00 per year will be saved.

Conduct an all-out search for visible and probable air leaks, particularly around and through windows. Check for cracks in walls and around doors.

Seal or repair these leaks with weatherstripping and caulking gum or putty, which can be purchased at your local hardware store. Purchase and install weatherstripping at least 1.8 inch thick around garage doors. The door should make a complete seal with the frame and ground when closed. Cracked windows may need to be replaced.

Make a routine inspection of your building to find and seal leaks at least once a year, as part of an overall building maintenance program.

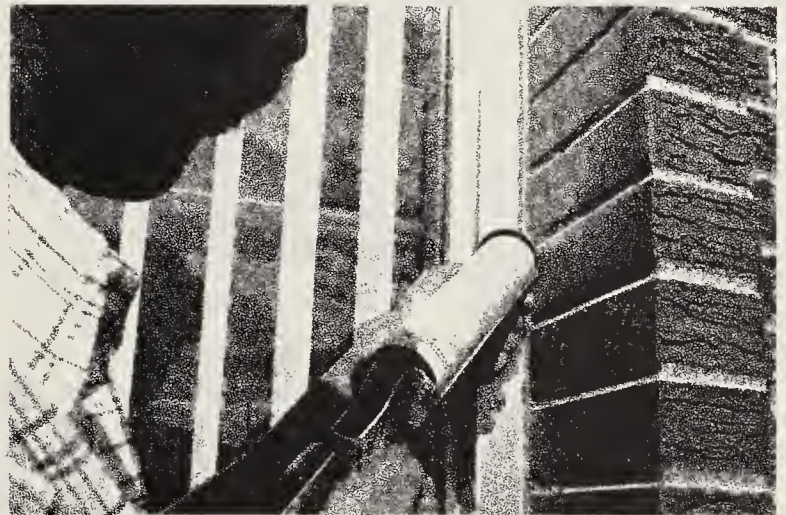
Be certain that all operable windows have sealing gaskets and cam latches that are in proper working order.

Consider posting a small sign next to each operable window instructing occupants not to open window while the building is being heated or cooled.

Replace any worn or broken weatherstripping. Install weatherstripping where none has been installed previously.

Rehang misaligned doors.

Caulk around door frames. Inspect all automatic door closers to ensure they are functioning properly. Consider adjustment to enable faster closing. Inspect gasketing on garage and other overhead doors. Repair, replace or install as necessary.



## ADD VESTIBULES TO OUTSIDE DOORS WHICH ARE USED FREQUENTLY

Doors which open directly to the outside and which have heavy traffic from customers or employees, allow heated air to easily escape. Constructing a simple vestibule inside the main doors helps maintain heating levels and prevents uncomfortable drafts for people working or shopping near the door.



# AIR CONDITIONING

Just as heating has played an important role in a building's energy expenses, so has space cooling. Air conditioning to excessive levels has been considered desirable to make the customer or employee comfortable and relaxed during summer months. Modern standards of energy efficiency ask that the air conditioning system maintain a reasonable internal comfort level, but the individual should not feel a drastic temperature change when entering or leaving the store.

## SET FORWARD AIR CONDITIONING TEMPERATURE

The simplest way to reduce the cost of cooling is to raise operating temperatures on a permanent basis. Comfort cooled areas can operate at 75°F to 78°F with little problem. For each degree the temperature is raised, cooling costs will be reduced by 4%.

Set the thermostat forward to 75°F to 78°F and lock in place with a guard to prevent employees from tampering with the setting.

At the end of the cooling season, turn off the thermostat to lower temperatures and make certain the air conditioning system cannot come on or else the air conditioning and heating systems will fight each other. It is important to reduce the setting during winter months so that when heating is used, you don't heat to the higher temperature.

Thermostat guards can be purchased for about \$10 to prevent employees from raising or lowering the temperature setting.



## SHUT OFF COOLING SYSTEM & REDUCE LOAD

Office and business places often leave air conditioning systems on at night, during weekends and on holidays. As cooling costs are expensive, the system should be shut down either manually or automatically. While the exact savings are dependent on climate, operating hours, etc., it is conservative to assume that at least 20% of the air conditioning cost can be saved through this procedure.

While this shutoff could be implemented manually at no cost, we recommend the installation of seven-day clocks which would guarantee turn-off and ensure that units turn on prior to occupancy (30-60 minutes) so that space will be comfortable when people arrive.

Begin precooling operations so the building is 5° below outside air temperature, or 80°F, whichever is higher, by the time occupants arrive. Complete cool-down during the first hour.

Consider closing outside air dampers during the first and last hours of occupancy and during peak loads.

During cooling season evening and night hours, flush the building with cooler outdoor air by opening doors and windows where security is not a problem.

Reduce use of cooling systems in spaces which are used infrequently or only for short periods of time.

Because many businesses have large store-front windows, the installation and use of solar film may help to reduce energy costs. Adding solar film to windows will reflect the sun's rays, cutting the summer-time heat load. This film adheres to the inside of windows and cuts penetration of infrared and visible light into interior areas. If your existing air conditioning system is undersized and cannot keep up with the solar load, the film is especially practical. This film is available from the major makers of tapes. Use window coverings to reduce solar heat gain. Draperies cut down solar heat gain by as much as 65 percent; venetian blinds, by 35 to 45 percent; shades by 40 to 75 percent.



When a retail store owner requires refrigeration, it can amount up to 30% of his total energy costs. An important factor in reducing operating costs is maintaining all components of the cooler unit in good condition. Insulation with weatherstripping or sealants further prevents energy loss. Other elements in efficiency include control of door opening, turning off equipment at night or raising the temperature setting, and turning off lights inside the cooler at night.

## RAISE NIGHT TEMPERATURE IN COOLERS AND TURN OFF INTERIOR LIGHTS

Substantial savings will be realized by letting night temperatures in coolers increase a few degrees.

Most storage coolers are well insulated and have little difficulty at night maintaining temperatures overnight when there is little traffic. The thermostat can be set forward to 45°-50°F, depending on the merchandise, without any damage to contents. It would be safe to turn the unit off completely at night if temperatures at 50°F could be tolerated for a few hours.

For additional savings, lights in coolers should be turned off. A single 150-watt incandescent lamp consumes about \$25 worth of electricity by running at night.

To turn off the unit automatically, a simple 24-hour timer, costing about \$25-\$50, can accomplish this.

SAVINGS PER YEAR DUE TO HIGHER TEMPERATURE SETTINGS IN COOLERS							
°F TEMPERATURE	2°	4°	6°	8°	10°	12°	14°
60-70 cubic feet	\$21	\$42	\$63	\$84	\$105	\$126	\$147

## CONTROL OPERATION EFFICIENCY

The retail operator can use his refrigeration units more efficiently by keeping them filled as much as is reasonable. In this way, the cooler operating costs are reduced on a "per item" basis. More merchandise is being cooled for the same price, less cold air escapes when the door is opened, and by keeping the cooler full, more merchandise than air is being cooled.

The main components in the cooler are the compressor, evaporator coil in the storage chest, condensate coil and controls. These components must be well maintained.

Keep cooler filled and emphasize efficiency in opening doors for merchandise.

Maintain components:

- The evaporator coil should be kept clean, frost-free and unobstructed so that air will circulate freely within the cooler.



- The condenser coil is cooled with air or water and must be maintained in a clean condition. A dirty coil reduces the efficiency of the unit and thereby increases the energy consumption. Depending on the amount of dirt build-up, a clean coil can reduce operating costs by as much as 40%.
- Freon lines from the compressor to the evaporator coil should always be insulated to save electricity and eliminate condensation problems.

Do not put freezer equipment in areas subject to cold. Refrigerant will not change from liquid to gas, consequently, the motor will run continuously.

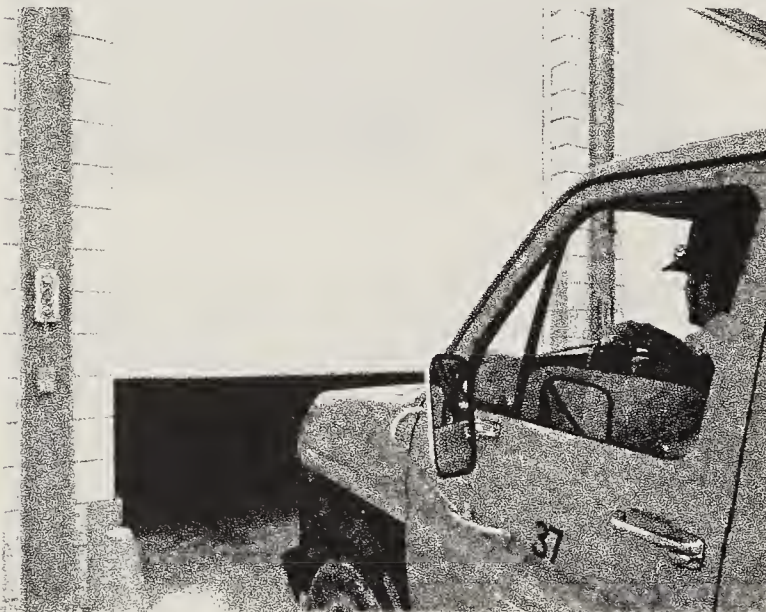


# WAREHOUSING

The potential for energy cost reduction in warehouse space is quite substantial because in many retail operations, depending on the type of product, a large percentage of the total square footage is used for storage of merchandise. Unlike the sales areas used for merchandising, warehouses do not have to be maintained at comfortable levels of lighting, heating, cooling or ventilating. Further, the possibilities for energy cost reduction around loading docks and garage areas are significant because of loss of conditioned air through openings. The same principles stated earlier for lighting, heating, cooling and ventilating can almost always be cost-effectively applied to warehouses. Specific application, of course, will depend on configuration of the space and the merchandise stored.

## REDUCE HEAT LOSS FROM OPEN GARAGE DOORS IN WAREHOUSES

Heat loss in warehouse areas tends to be overlooked since customer comfort is not involved in that location of the retail operation. Wasted heat can be significant, however, as a result of heating systems operating constantly to condition outside air flooding in from open garage doors.

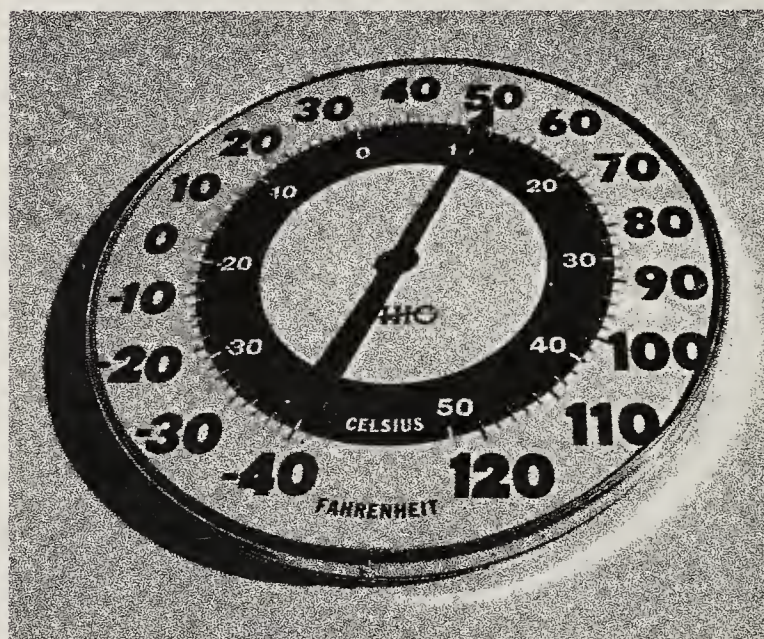


Open garage doors probably represent the single largest heat loss in warehouses. Reducing the length of time that garage doors remain open prevents this heat loss.

Set up a regular procedure for closing garage doors manually, or install a mechanism for automatically minimizing door openings.

## USE EFFICIENT LIGHTING, HEATING & COOLING IN WAREHOUSE SPACE

Lower lighting levels and less comfortable temperatures will usually be tolerated in warehouse space. Efficient environmental control in storage space produces *high* cost savings due to the amount of space involved and the potential *range* of reduction.



In heating, space can be kept about 50°F. Compared to space at 70°F, this change reduces heating costs 30-40%. Reducing temperatures during non-working hours to as low as 40°F is recommended unless the merchandise cannot tolerate temperature fluctuations.

In lighting, warehouses can nearly always be cost effectively relamped. Hours of use and the number of fixtures should be reduced. High pressure sodium and metal halide are the most effective sources, most effective at ceiling heights. Low energy lamps should be used, and incandescent lamps replaced altogether.



# OTHER ENERGY CONSERVATION IDEAS

At end of day turn off drinking fountain cooler and other dispensers (other than perishables).

Turn off electrical equipment when not in use, such as desk lamps, typewriters, coffee pots, and so on. Certain equipment can only be turned off at the end of the day, though, but please be sure you do turn it off, especially the copying machines.

Whenever you can, group your errands together so you don't have to use the elevators as much. Do four things on one floor while you're there rather than making four separate trips. If possible, use the stairs instead of the elevators.

Close off unused areas and rooms. Where possible, be certain that blinds or other shading devices are drawn, registers closed, etc.

Turn heat off during last hour of occupancy.

Isolate storage room areas from sales area. Maintain storage areas at 60°F or lower in winter.

Shut off all heating in garages, docks and platform areas.

Turn off humidifiers whenever the building is closed for extended periods of time, except when process or equipment requirements take precedence.

Curtail humidification for areas such as hallways, equipment rooms, lobbies, laundry areas, and similar spaces.

Reduce use of heating and cooling systems in spaces which are used infrequently or only for short periods of time.

Consider placing a small sign next to each door leading to the exterior or unconditioned spaces advising occupants to keep door closed at all times when not in use.

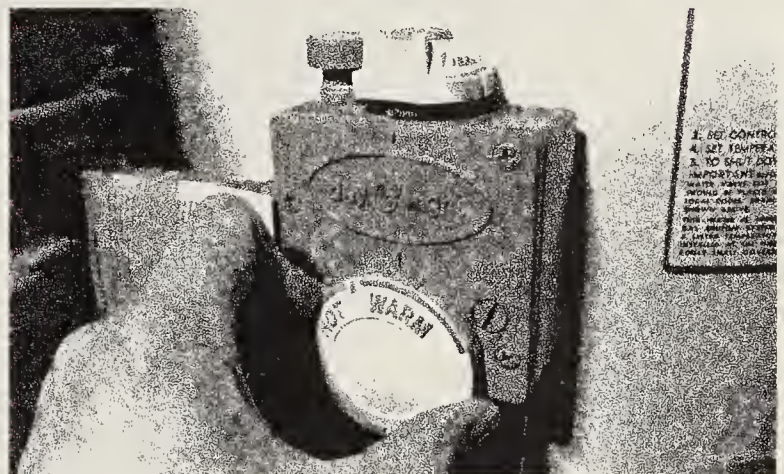
Adjust the timing mechanism of automatic doors so that doors remain open only as long as is necessary to allow customers and parcels to pass safely. All doors should be adjusted to close automatically.

Many businesses run fans or leave window vents open for ventilating areas that are closed-in or areas where fumes are generated. Fans should always be turned off at the end of the work day and outside air vents should be closed during non-working hours, particularly during the heating season.

## HOT WATER

Although water conservation is a very important end in itself, the primary concern for energy cost reduction is in saving the energy used to heat water. There are essentially two types of potential savings:

- Reducing the temperature.
- Reducing the flow rate of hot water.



Reducing the hot water temperature setting to 120°F for normal use will save a significant amount of the fuel used to heat the water. If hot water is needed for special processes in a business (such as restaurant dishwashing), temperature reduction may not be advisable. But in employee washrooms and for general-purpose cleaning, a lower water temperature can usually be tolerated.

It is possible to reduce the rate of flow of hot water by installing either restrictors or low-flow aerators on sink faucets. Low-flow aerators cost only about \$1 each and usually perform better than restrictors.

## SPECIAL ELECTRIC SWITCH STICKER AVAILABLE

We've designed a sticker that easily attaches to light switches, air conditioning switches and other electric conveniences. It's a reminder to conserve energy whenever possible.

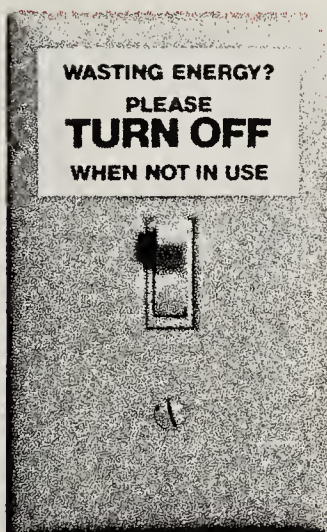
A set of 20, 1 1/4" x 2 1/4" self adhesive orange fluorescent vinyl stickers with black printing—including handling and mailing—\$1.00.

Write for quantity discounts on orders of more than 100.

Name \_\_\_\_\_ Address \_\_\_\_\_

City \_\_\_\_\_ Zip Code \_\_\_\_\_

Send orders to Artcraft Printers, 241 East Main, Bozeman, MT 59715.





# ADDITIONAL ENERGY CONSERVATION PUBLICATIONS

The energy conservation measures presented in this booklet are general—applying to most types of businesses. Specific publications are available for those firms who wish to initiate energy conservation programs tailored to their type of business. Listed are publications that may be obtained. If your business is not represented in this list, a more comprehensive list is available in catalog form. Titled “Energy Conservation and Environment Publications,” the catalog contains publications and materials produced by the Office of Conservation and its contractors. All publications, including the catalog, may be obtained by writing (give “NTIS” or “GPO” and order number), National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia, 22161; or Superintendent of Documents, U. S. Government Printing Office, Washington, D.C., 20402.

**ENERGY CONSERVATION APPLIED TO OFFICE LIGHTING.** The report reviews the literature and findings upon which the past practice of lighting design has been based, and makes recommendations and suggestions for changes that can be instituted to make lighting design and installation in the future more responsive to the needs of energy conservation (288 pp).

NTIS: PB-244-154 \$9.25

**EVALUATION OF BUILDING CHARACTERISTICS RELATIVE TO ENERGY CONSUMPTION IN OFFICE BUILDINGS.** The report presents a survey of office building factors which impact energy consumption. It offers a baseline for future research in buildings energy consumption monitoring (69 pp).

NTIS: PB-248-774/2ST \$4.50

**GUIDELINES FOR SAVING ENERGY IN EXISTING BUILDINGS. BUILDING OWNERS AND OPERATORS MANUAL: ECM 1.** This report examines national energy usage in existing commercial buildings, methods of reducing energy consumption, and the resulting costs and benefits. It describes options and minor modifications to buildings and mechanical and electrical systems that can be implemented immediately with little if any investment cost (299 pp).

NTIS: PB-249-928 \$9.25

GPO: 041-018-00079-8 \$5.25

**GUIDELINES FOR SAVING ENERGY IN EXISTING BUILDING. ENGINEERS, ARCHITECTS, AND OPERATORS MANUAL: ECM 2.** Additional ways for lowering operating costs are presented (448 pp).

NTIS: PB-249-929 \$10.00

GPO: 041-018-00080-1 \$5.05

**LIGHTING AND THERMAL OPERATIONS.** This publication contains guidelines which represent desirable targets for illumination levels, lighting efficiency, and operation of heating and cooling systems. It is based upon a study of 19 Federal office buildings. Energy consumptions are listed, before and after implementation of the energy conservation programs which included recommendations for illumination, thermostat settings, building occupancy, and fan operation (20 pp).

NTIS: PB-245-047 \$4.50

**PHYSICAL CHARACTERISTICS, ENERGY CONSUMPTIONS, AND RELATED INSTITUTIONAL FACTORS IN THE COMMERCIAL SECTOR.**

This report addresses the physical characteristics of existing commercial buildings in Baltimore, Maryland, and Denver, Colorado with emphasis upon factors related to constructing and/or operating energy efficient commercial buildings.

NTIS: PB-249-470 \$7.50

GPO: 041-018-00130-1 \$2.50

**GUIDE TO ENERGY CONSERVATION FOR FOOD SERVICE.** This paper discusses how to conserve energy in a food service establishment (74 pp).

NTIS: PB-249-462 \$5.00

GPO: 041-018-00127-1 \$2.25

**ENERGY CONSERVATION PROGRAM GUIDE FOR INDUSTRY AND COMMERCE.** This handbook is offered for persons responsible for implementing energy conservation programs in intermediate and small-sized firms. It provides engineering data, procedures for financial analysis, sources of assistance, and other information to help in establishing energy conservation programs (212 pp).

GPO: 003-003-01323-4 \$2.90

**ENERGY CONSERVATION PROGRAM GUIDE FOR INDUSTRY AND COMMERCE—SUPPLEMENT 1.** This supplement includes revised explanations of how to implement an energy conservation program, an expanded checklist of energy conservation opportunities, additional case histories, and revisions to sections of the handbook specified above (89 pp).

GPO: 003-003-01582-2 \$2.25

**ENERGY CONSERVATION IN NEW BUILDING DESIGN. AN IMPACT ASSESSMENT OF ASHRAE STANDARD 90-75.** This report assesses the economic and institutional impacts that may result from the broad voluntary adoption of ASHRAE Standard 90-75 by individual building regulatory authorities. This Standard deals with energy use in new buildings and is available for optional acceptance by State and local governments (273 pp).

NTIS: PB-252-639 \$9.00

GPO: 041-018-00098-4 \$3.35

**TOTAL ENERGY MANAGEMENT: A PRACTICAL HANDBOOK ON ENERGY CONSERVATION AND MANAGEMENT.** This handbook provides a practical approach for building owners and managers for implementing energy conservation procedures (61 pp).

NTIS: PB-254-683 \$4.50

**ASSESSMENT OF THE POTENTIAL FOR ENERGY CONSERVATION THROUGH IMPROVED INDUSTRIAL BOILER EFFICIENCY: VOLUME 1.** This volume concentrates upon boiler efficiency for the use of three fuels—gas, oil, and coal. On-site tests were made to determine the “as found” operating conditions of selected boilers. These tests revealed areas of poor maintenance that had a direct impact on boiler efficiency and fuel use. The report states the significant near-term savings that can be achieved by a relatively inexpensive boiler maintenance (276 pp).

NTIS: PB-262-576/AS \$9.25

**GUIDE TO ENERGY CONSERVATION FOR GROCERY STORES.** Provides energy conservation techniques and information for grocery stores (42 pp).

GPO: 041-018-00133-6 \$1.90

**22U ENERGY MANAGEMENT GUIDE FOR LIGHT INDUSTRY AND COMMERCE.** This guide describes some simple methods by which the manager of a small business can analyze his energy use, determine the areas in which energy savings can be made, and estimate the magnitude of the possible cost savings. The program starts with an energy audit based on fuel and utility bills. A more detailed audit, designed to locate major energy uses, is discussed in some detail. 1976. (23 pp).

C 13.11:120

S/N 003-003-01667-5 70¢



## YOU CAN HELP US

We would appreciate knowing any action taken or planned in your business to cut energy costs. Please check list and mail.

DONE	PLAN		
	TO	NO	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Ordered additional energy publications
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Conduct an energy audit of building
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Set up tracking for energy use
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Contacted utility for assistance
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Reduce interior lighting with more efficient or fewer lights
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	More efficient parking lot and security lighting
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Set back temperature to 55°F night or weekend
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Reduce daytime temperatures to more economical levels
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Added insulation or weatherstrip doors or windows
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Set forward air conditioning temperature
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Shut off air conditioning night or weekend
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Raise night temperature in cooler
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Reduce heat loss in warehouse

BUSINESS \_\_\_\_\_ ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ ZIP CODE \_\_\_\_\_

NAME OF ENERGY CONSERVATION OFFICER IN BUSINESS \_\_\_\_\_

PLEASE  
PLACE  
STAMP  
HERE

Montana Chamber of Commerce  
P.O. Box 1730  
Helena, MT 59601



# ADDITIONAL ENERGY CONSERVATION PUBLICATIONS

## NON-FEDERAL SMALL BUSINESS WORKSHOP BOOKS

### ENERGY COST REDUCTION FOR APARTMENT OWNERS & MANAGERS (61 pgs).

Institute of Real Estate Management of the National Assoc. of Realtors  
403 North Michigan Avenue  
Chicago, IL 60611 \$3.00

### ENERGY COST REDUCTION IN THE FABRICARE INDUSTRY (40 pgs).

International Fabricare Institute  
P.O. Box 940  
Joliet, IL 60434 \$2.50

### ENERGY COST REDUCTION FOR AUTOMOTIVE SERVICE FACILITIES (19 pgs).

The Automotive Service Councils, Inc.  
188 Industrial Drive, Suite 112  
Elmhurst, IL 60126 \$1.50

### ENERGY COST REDUCTION PROGRAM FOR THE PRINTING INDUSTRY (53 pgs).

Management Services  
Printing Industries of America  
1730 North Lynn Street  
Arlington, VA 22209 \$5.00

### ENERGY COST REDUCTION FOR AUTOMOBILE DEALERS (35 pgs).

National Automobile Dealers Assn.  
8400 West Park Drive  
McLean, VA 22101 \$2.50

### ENERGY COST REDUCTION FOR GASOLINE SERVICE STATIONS (23 pgs).

National Congress of Petroleum Retailers  
Suite 301, 2021 "K" Street, NW  
Washington, DC 20006 \$1.00

### ENERGY COST REDUCTION IN RETAILING (70 pgs).

American Retail Federation  
1616 "11" Street, NW  
Washington, DC 20036 \$2.50

## TRACKING YOUR ENERGY USE

Here is a convenient form to monitor your energy use from year to year. If you still have your past year's energy bills, record the energy consumption in Kilowatts (KWH) for electricity, Thousand Cubic Feet (MCF) for gas, or if you use fuel oil, in gallons. Recording dollars may not be comparable because of

any rate adjustments. The important thing is how your conservation effort is doing in reduced energy consumption.

If you do not have past energy bills, start tracking your monthly energy use now. If you have trouble interpreting the bill, call your utility.

	ELECTRICITY (KWH)			GAS (MCF)			FUEL (GAL.)			WATER (GAL.)		
MONTH	1st	Years 2nd	3rd	1st	Years 2nd	3rd	1st	Years 2nd	3rd	1st	Years 2nd	3rd
JANUARY												
FEBRUARY												
MARCH												
APRIL												
MAY												
JUNE												
JULY												
AUGUST												
SEPTEMBER												
OCTOBER												
NOVEMBER												
DECEMBER												

# COMMERCIAL-INDUSTRIAL ENERGY AUDIT

## ADMINISTRATION

1. ☐ ☐ Appoint an "Energy Chief" to be responsible for implementing the energy-cost reduction plan and to mark its progress.

## LIGHTING

2. ☐ ☐ When leaving an unoccupied area for any length of time, turn off lights, post "Lights Out" signs.
3. ☐ ☐ Reduce lighting in non-critical areas or use more efficient light sources.
4. ☐ ☐ Disconnect ballast in multi-tube fixtures where lamps are removed.
5. ☐ ☐ Establish regular cleaning schedule of light fixtures for greater efficiency in light output.
6. ☐ ☐ Use time clocks on night display lights. (Turn off earlier if traffic is low).
7. ☐ ☐ Operate exterior lights on time clock except where needed for security.
8. ☐ ☐ Utilize more efficient lamps wherever possible. (Fluorescent lighting reduces power consumption approximately 60% while maintaining same light level produced by incandescent lighting).
9. ☐ ☐ Light colored walls and ceilings will increase light efficiency.
10. ☐ ☐ Add light switches so that areas not in use can be turned off. Identify switches.
11. ☐ ☐ Reduce lighting in hallways, but not below levels required to meet safety standards.
12. ☐ ☐ Use most efficient outdoor lighting sources for safety and security. Switch with photo-cells or time clocks.

## HEATING, VENTILATING AND AIR CONDITIONING

13. ☐ ☐ Reduce daytime thermostat setting for heating to 65°F and 55°F for night and weekends.
14. ☐ ☐ Increase thermostat setting for air conditioning to 78°F daytime and off at night and weekends.
15. ☐ ☐ Unoccupied areas can be heated at lower thermostat settings, possibly 45°F.
16. ☐ ☐ Tamper-proof thermostats prevent arbitrarily changing efficient temperature settings.
17. ☐ ☐ Reduce amount of fresh air into heating/cooling system. Utilize odor-absorbing systems.
18. ☐ ☐ Chillers could be turned off one hour earlier before end of day...flywheel effect.
19. ☐ ☐ Reclaim waste heat from refrigeration or other heating producing systems. Could be utilized to save energy.
20. ☐ ☐ Reduce infiltration through better window, door and entry design. Vestibules for outside doors will save energy.
21. ☐ ☐ Use outside air for cooling when possible.
22. ☐ ☐ Provide outside combustion air for fossil-fired equipment.
23. ☐ ☐ Keep air filters clean to reduce load on air handling fans. Establish regular maintenance on all HVAC equipment.
24. ☐ ☐ Check time clocks and thermostats for calibration.
25. ☐ ☐ Keep shipping and receiving doors closed when not in use.
26. ☐ ☐ Check domestic hot water heater thermostat setting and water taps for leaks. Also use flow restrictors.
27. ☐ ☐ Check large induction motor loads for possible need of PF correction through use of capacitors located at the motor.
28. ☐ ☐ Load limiting devices could be adopted to help reduce demand.

## INSULATION AND GLASS

29. ☐ ☐ Increase ceiling insulation to reduce heat loss and heat gain. Increase wall and floor insulation if practical.
30. ☐ ☐ Install double glazing where practical.
31. ☐ ☐ Check possible infiltration areas and correct. Caulking around windows may be needed.
32. ☐ ☐ Shade or screen windows to reduce both heating and cooling losses.
33. ☐ ☐ Reflective film applied to glass can reduce heat gain.
34. ☐ ☐ Hot water and/or steam line insulation needs repaired or replaced.

## CONSERVATION PUBLICATIONS

35. ☐ ☐ Order appropriate conservation materials.